

**Polyphase-Discrete Fourier Transform (DFT) Sub-band Definition
Filtering Architecture**
Abstract of the Invention

A system and method for demultiplexing an RF signal including nested frequency
5 division multiplexed (FDM) channels is disclosed. The system can demultiplex an RF signal
including at least two nested sets of FDM channels extending over a bandwidth B. The system
can include a baseband converter that converts the RF signal to a baseband signal where the
center frequency of the baseband signal is offset from DC by an amount equal to an integer
multiple of the channel spacing of a widest of the nested FDM channels; an analog to digital
10 converter (ADC) that converts the baseband signal to a digital signal at a sampling rate equal to
four times the offset; a complex baseband digital signal generator, coupled to the analog to
digital converter, that performs a half-band complex bandshift of the digital signal and that filters
the half-band complex bandshifted signal with a two to one decimating, symmetric, half-band
finite impulse response (FIR) filter to generate a complex baseband digital signal; a k stage sub-
15 band definition network, coupled to the complex baseband digital signal generator, that divides
the complex baseband digital signal into k sets of sub-band output signals, where each stage of
the k stage sub-band definition network can include a plurality of parallel polyphase-discrete
Fourier transform (PPF-DFT) filter banks, where the PPF-DFT filter banks, where appropriate to
align sub-band signals with filter pass-bands of the PPF-DFT filter banks, can be preceded by a
20 quarter-band or sixth-band complex bandshift, and can be followed by an eighth-band complex
bandshift; and sub-band demultiplexers, coupled to the k sets of sub-band output signals, that
demultiplex each of the sub-band output signals to obtain k sets of demultiplexed sub-band
channel signals.

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